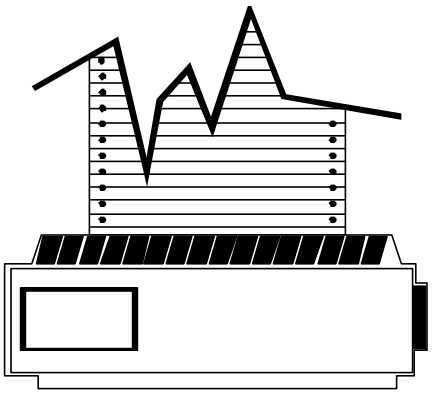

MONITORING AND TRACKING

LONG-TERM GOAL (15-YEAR)

The overall goal of Virginia's nonpoint source pollution monitoring and tracking programs is to support the development, implementation and evaluation of the nonpoint source pollution management program. Monitoring and tracking measure the effectiveness of the management program to ensure that the beneficial uses of Virginia's waters are attained and maintained

INTRODUCTION

Water quality monitoring and tracking nonpoint source pollution control implementation are essential elements of Virginia's Nonpoint Source Pollution Management Program. Monitoring and tracking support and direct program activities by providing information on water quality and the health of water resources. The Department of Environmental Quality (DEQ) administers the state ambient water quality monitoring programs. The Department of Conservation and Recreation (DCR) is the lead state agency for supporting and tracking nonpoint source (NPS) pollution control implementation. Both DCR and DEQ support citizen monitoring efforts in Virginia. Identifying water quality problems and the sources of impairment is a major focus of Virginia's water quality monitoring program.

Virginia's plan for NPS pollution monitoring and tracking activities identifies the roles and responsibilities of various state agencies and other organizations, and potential barriers to conducting a comprehensive program. The results are summarized in the narrative and tables that follow.

Federal and state laws and regulations identified in this chapter are listed at the end. A glossary of terms associated with monitoring, tracking and water quality activities can be found in another section of this document.

AGENCY ROLES & RESPONSIBILITIES

The two key state agencies fundamental to monitoring and tracking activities for Virginia are DEQ and DCR. In addition, several other state agencies provide support specific to their areas of responsibility and expertise. These agencies include the Department of Health; Department of Forestry; Department of Mines, Minerals and Energy; Department of Game and Inland Fisheries; the Chesapeake Bay Local Assistance Department; and the Virginia Cooperative Extension. Furthermore, three federal agencies provide support to the state's activities, U.S. Environmental Protection Agency (EPA), U.S. Geological Survey and Natural Resource Conservation Service. Coordination and communication between these state and federal agencies are maintained through

an interagency committee known as the Nonpoint Source Advisory Committee. This committee is coordinated by DCR. The major roles and responsibilities of these agencies are described below.

Department of Environmental Quality

The State Water Control Board was consolidated into the Department of Environmental Quality (DEQ) along with three other state agencies in 1993, and has had the responsibility for monitoring the quality of the state's waters since such activities began in the late 1950s. At the present time (May 1999), DEQ has more than 2000 monitoring stations, distributed throughout the estuarine and fresh waters of the commonwealth. As required by the Clean Water Act of 1987, water quality monitoring stations provide an ongoing characterization of water quality and data for the Section 305(b) and Section 303(d) Assessment Reports that are submitted to EPA and Congress. DEQ monitors a standard group of parameters including nutrients and related classes, toxic compounds with Water Quality Standards, benthic community, and many others as necessary to determine water quality. DEQ monitors various matrices including surface waters, sediment, fish tissue, ground water, and others to determine the overall water quality in streams, lakes, rivers, estuaries, wetlands, and open waters. The results of this monitoring are stored in EPA's national database (STORET) and are published at the end of each monitoring year (1 July to 30 June) as the Virginia (DEQ) Ambient Water Quality Monitoring Report.

Department of Conservation and Recreation

The lead NPS pollution control agency for Virginia is the Department of Conservation and Recreation (DCR). As such, it develops and implements all statewide NPS pollution control programs and services and coordinates the Nonpoint Source Advisory Committee (NPSAC). DCR is responsible for developing the state's NPS pollution assessment, a comparative evaluation of the state's waters on a watershed basis, to assist in targeting NPS pollution activities. As required by Section 319 of the Clean Water Act of 1987, the first statewide assessment was completed in 1988, with subsequent updates and refinements conducted periodically since that time. The assessment ranks the state's nearly 500 watersheds, based on land use, animal density, forest harvesting, disturbed urban acres, best management practices (BMPs) implementation and other related factors, for NPS pollution potential. The rankings are used to direct the implementation of Virginia's NPS pollution control programs, as well as committing a significant portion of the state's nonpoint source grant funding to the most critical watersheds.

DCR also administers NPS pollution control programs required by state law. These programs include erosion and sediment control, stormwater management, nutrient management, agricultural BMPs, shoreline erosion control, floodplain management, dam safety, and public beach conservation, and provides the administrative, technical and financial support to soil and water conservation districts. DCR tracks implementation of these programs.

DCR addresses nonpoint source impacts to groundwater quality in the karst headwaters of the Shenandoah, James,. Roanoke, and Upper Tennessee river basins in western Virginia through specific groundwater monitoring and source water assessment studies. DCR cooperates with VDH, DEQ, and the SWCDs in implementing these investigations.

Virginia Department of Health

The Virginia Department of Health (VDH) participates in several areas of NPS pollution monitoring and tracking. These include septic systems, source water protection, shellfish and human health advisories and alerts. VDH is the permitting authority for on-site sewage disposal systems in the commonwealth. The department generally does not require monitoring of on-site sewage disposal systems. Exceptions include experimental and proprietary systems, and discharging systems for single family homes. Private wells and public water supplies are regulated by VDH. Fulfilling the requirements of the federal Safe Drinking Water Act and amendments are a priority, as evidenced by the state's Source Water Assessment and Source Water Protection programs. The department monitors shellfish growing areas and regularly conducts surveys to identify contributors to pollution of these waters. VDH conducts limited recreational water monitoring in Norfolk and Virginia Beach, and the counties of Bedford, Franklin and Fairfax.

Regarding human health, VDH's activities include providing consultation and advice on issues of water-related health problems; investigating and responding to reports of illness related to exposure to water in Virginia; maintaining databases on water-related illness and water quality data; conducting epidemiologic studies to determine risk factors for waterborne illness; contributing to the development of water related policy, regulations and laws; and collaborating and coordinating with state and federal agencies and institutions to address waterborne problems. VDH list public health advisories incorporating data provided by DEQ's monitoring program.

Chesapeake Bay Local Assistance Department

In response to the Chesapeake Bay Preservation Act of 1988, the Chesapeake Bay Local Assistance Department (CBLAD) developed a set of land use regulations and policies. These land use regulations and policies are administered by local governments throughout Tidewater, Virginia, to protect water quality. The overall goal of the department's water quality monitoring program is to determine the efficacy of these regulations and policies in protecting water quality from the impacts of adjacent urban development activities. A comprehensive assessment of the effect of the regulations is being made through a 10-year interdisciplinary project initiated in 1993 and is located on Polecat Creek in Caroline County. The project is expected to provide basic water quality data and detailed information on the background state and the trends in water quality in response to the changes in land use/land cover and the implementation of local land use regulations. The quantity and quality of surface and ground waters, biological status of streams and land use changes are being monitored within the watershed. The information collected will be used to identify any trend in water quality, and to develop a water quality model to assess the impacts of various land use scenarios on water quality and on the biological indices of the streams.

Virginia Department of Forestry

The Department of Forestry (DOF) is responsible for tracking compliance over time with forestry BMPs and changes over time in pollutant loads from silvicultural harvesting activities across the state. In fulfilling these responsibilities, DOF assesses the implementation and effectiveness of forestry BMPs and the sediment loads associated with silvicultural operations. DOF administers Virginia's Silviculture and Water Quality Law based on indications that sedimentation is exceeding normal amounts.

Virginia Department of Mines, Minerals and Energy

The Department of Mines, Minerals and Energy (DMME) administers state regulatory programs governing safety and reclamation on mineral resource extraction sites in Virginia. DMME also operates inventory and construction programs designed to identify and eliminate public safety hazards and pollution from abandoned coal and mineral mines, and gas and oil wells. DMME's mission is to enhance the development and conservation of energy and mineral resources in a safe and environmentally sound manner to support a more productive economy. Monitoring to evaluate pollutants and assess the success of reclamation efforts is a continuous component of DMME's reclamation programs.

Virginia Department of Game and Inland Fisheries

The Department of Game and Inland Fisheries (VDGIF) is responsible for managing the state's fish and wildlife resources including those associated with biotic environments. Part of that management includes comprehensive samples of the aquatic fauna and evaluation of its health. Biological information on fish and mussels is used to evaluate the impacts of NPS pollution and the benefits of programs that address this type of pollution.

Virginia Cooperative Extension

Virginia Cooperative Extension Service (VCE) coordinates the Farm*A*Syst and Home*A*Syst programs for the state. Both are voluntary self-assessment programs that can be used to evaluate environmental and health risks on a property with emphasis on protecting domestic water supplies. Under the Farm*A*Syst program, trained staff work with participating farm families to conduct an assessment of

their farm and provide assistance in making the necessary corrections to remedy any hazardous situation on the farmstead. The program is administered in cooperation with the USDA Natural Resource Conservation Service (NRCS). Home*A*Syst identifies environmental risks, concerns or problems in and around the home, provides information on better home and property management and recommends preventive actions to safeguard the homeowner's health and the surrounding environment.

ISSUE IDENTIFICATION & PROGRAM ASSESSMENT

Historically, Virginia has focused monitoring efforts on point source discharges. Although DEQ has relocated many of its monitoring stations and expanded its monitoring network to enhance ambient water quality data collection and support nonpoint source monitoring needs, the placement of monitoring stations continues to reflect a point source bias. A key challenge to Virginia monitoring programs will be to ensure that the location and design of monitoring stations reflect the increasing focus on reducing nonpoint sources of water pollution.

Lack of stream flow data, groundwater levels and quality of data, and data consistency have also been identified as significant monitoring issues. As Virginia moves forward with developing total maximum daily loads (TMDLs) for streams impaired by nonpoint sources of pollution, data consistency and the availability of flow data will be essential for analyses of pollutant load allocations.

EXISTING STATE MONITORING PROGRAMS:

Ambient Water Quality Monitoring Program

DEQ's *Ambient Water Quality Monitoring Network* contains more than 1,200 sampling stations. Samples are tested for a number of chemical and physical parameters to assess water quality throughout the commonwealth. Long term water quality trends can be determined from this monitoring program.

The *Virginia Biological Monitoring Program (VBMP)* is administered by DEQ's water division and consists of more than 200 stations within 116 hydrologic units (HUs). This program uses EPA's Rapid Bioassessment Protocol II habitat assessment technique to monitor benthic macroinvertebrates to classify water quality as nonimpaired, moderately impaired or severely impaired. These classifications are used to help determine if water quality meets the fishable goals of the Clean Water Act and the State Water Control Law.

The Chesapeake Bay Fall Line Monitoring Program

DEQ, in cooperation with the USGS, operates five fall line monitoring stations to characterize nutrient and sediment loads entering the Chesapeake Bay and Virginia's tidal tributaries (the James, Appomattox, Rappahannock, Mattaponi, and Pamunkey rivers). The objective of this monitoring program is to characterize nutrient and sediment loading to the Chesapeake Bay and the tidal portion of its tributaries originating in the James, Rappahannock and York river basins.

Samples from these stations are tested for nitrogen, phosphorus, carbon, inorganic sediments and silica. Samples are taken semi-monthly from base flow, and approximately 30 times a year during high flow periods. Sampling is conducted during both base flow and high flow periods in order to accurately characterize total loading entering the tidal rivers from the watershed above the sampling points. This total loading is composed of nutrients and sediment originating from both point and nonpoint sources in the watershed. Various methods (e.g. computer simulation models, land use information, examination of concentration/riverflow associations) are used to estimate the percentages of point versus nonpoint inputs.

The Chesapeake Bay Monitoring Program

Monitoring stations are located throughout the mainstem of Chesapeake Bay and the tidal portion of the James, Rappahannock, and York rivers. Sampling of water quality and biological conditions is conducted to characterize ecological status and trends in the Chesapeake Bay and Virginia's tidal tributaries. These ecological conditions are, to a large degree, influenced by inputs of nutrients originating from both point and nonpoint sources in the watershed. Samples are

routinely collected either semi-monthly, monthly or quarterly.

The Department of Forestry Water Quality Monitoring Program

DOF's water quality monitoring program began in 1990 as a part of the DOF NPS pollution reduction initiative. It combines chemical and biological monitoring with computer simulation modeling to produce insights into the characteristic and dynamic behavior of water in forest ecosystems. The program helps document the effects of timber harvesting on water quality. DOF monitoring is funded through an EPA grant administered by DCR.

EXISTING CITIZEN MONITORING PROGRAMS:

Alliance for the Chesapeake Bay's Virginia Citizen Monitoring Program:

The Chesapeake Bay Citizen Monitoring Program is a network of 140 volunteers in Maryland, Pennsylvania and Virginia that collects water quality data and information about the Chesapeake Bay and its tributaries. A quality assurance plan has been developed to ensure the precision and accuracy of data collected by its volunteers.

Since its inception in Virginia, in 1985, Virginia's program has grown substantially. Initially there were 16 sites on the James River. Now the program has grown to more than 120 volunteers on the James, York, Rappahannock, Potomac, Piankatank, Mattaponi, Pamunkey, Lynnhaven and Elizabeth rivers, as well as on the creeks and embayments of the Eastern Shore.

The parameters tested are air and water temperature, water depth and clarity, salinity, pH and dissolved oxygen. Monitors also record wildlife observations, field observations of water conditions and color, weather, precipitation and general conditions of the site. All monitors sample weekly throughout the year. According to DEQ program staff, there are approximately 400 citizen monitoring stations at this time. In 1992, a pilot nutrient sampling program began at eight sites and eight more sites were designated as Zebra Mussels Monitoring Stations.

The nutrient sampling program was implemented in conjunction with DEQ's water division. For this program, 10 sites were chosen in areas of submerged aquatic vegetation (SAV). Sampling results will be used to help evaluate present status and future trends of nutrient concentrations in SAV growing areas.

Data generated by this program is used to augment DEQ's mid-channel monitoring program. Citizen monitoring data are taken at near-shore sites and provide a means of analyzing the correlation between near-shore and mid-channel data. In 1992, citizen monitoring data were, for the first time, used to make assessments in Virginia's 305(b) report to Congress on the quality of the state's waters. The wildlife observations, which are recorded with the help of a field guide, provide input to the DGIF on sightings of common or ordinary species.

To better manage the expanded program and provide feedback to the volunteers, a data management software program, CitMon*MAN, was developed. The program was presented at the second annual Virginia Environmental Education Conference, third National Citizen Monitoring Conference and the Coastal Society Conference. Data from the field are collected, verified and entered by 10 volunteer Watershed Coordinators. The data is then imported to the central computer in the DEQ Richmond office where it is used to make individual tabular reports and graphs for monitors. This software makes available a standardized format for reporting volunteer water quality data to state agencies. All data are also sent to the Chesapeake Bay Program office in Annapolis, Maryland where files can be accessed by state agencies and other interested parties.

Izaak Walton League of America's Save Our Streams Program

The Izaak Walton League of America (IWLA) formally began the Save Our Streams (SOS) program in Virginia in 1988. The objectives of this program are:

- to increase the state's ability to assess surface water quality;
- to promote an awareness of the state's aquatic resources; and

- to bring concerned citizens together to more effectively address water quality issues on a watershed level.

Funding for the SOS program has been provided, in the past, by grants from DCR and the Virginia Environmental Endowment. Biological monitoring data is collected by citizen volunteers at more than 240 stations across the state and sent to DCR as completed survey forms.

Virginia volunteers are trained to identify water pollution problems and to survey stream-dwelling organisms (macroinvertebrates) and various physical characteristics in order to determine stream health. Also, volunteers receive a SOS sampling kit that contains the equipment, references, and directions necessary to conduct biological monitoring. Volunteers adopt a freshwater stream with one or more monitoring points (stations) along the stream. Each station is generally monitored four to six times a year.

IWLA's biological monitoring is conducted in 71 of the state's 494 hydrologic units. The greatest spatial coverage is in the urbanized watersheds in Northern Virginia. The number of SOS monitoring stations in Eastern Virginia is very sparse. This is because the SOS monitoring protocol was initially designed for shallow, free-flowing freshwater streams and was not applicable to saltwater invertebrates or coastal plain streams that are dominated by pool habitats.

DCR is working with citizen groups to solicit volunteers in those watersheds that have received a high priority in the state's nonpoint source assessment ranking.

EXISTING BMP TRACKING PROGRAM:

Nutrient Management Plan Tracking Activities

Virginia's Nutrient Management Program has used a computer tracking and reporting system known as NMTRACK in several versions since 1989. The major items reported by the program include number of nutrient management plans completed, planned acreage, and nitrogen and phosphorus reductions achieved by plan implementation. Additional data were supplied on plan-related activities such as the number of manure tests run, manure spreader calibrations, quick nitrate tests, test plots established and harvested, farmer contacts, media contacts, and presentations made.

The program was updated to accommodate reporting on expanded activities related to the accomplishment of specific goals within the program's strategic workplan. These items include nutrient management plan revisions, plans reviewed, plan follow-ups, plan development, sludge site reviews, cold calls to farmers (phone and personal), referrals received, nutrient industry contacts, media articles written, and nutrient management displays used.

Virginia Agricultural BMP Cost-Share Program Monitoring and Tracking

BMP implementation resulting from enrollment in the Virginia Agricultural BMP Cost-Share Program is tracked in a digital database. DCR uses the database to determine water quality improvements, to guide adjustments in program funding and administration, and to create random lists for program compliance spot checks. At the local level, soil and water conservation districts also use the BMP tracking information.

Soil and water conservation districts enter information regarding each request for cost-share assistance into local databases. Each district periodically uses the database to sort, target and rank requests for cost-share and approve funding for BMP implementation. The database allows districts to monitor local BMP implementation, local program funding status and to request disbursement of program funds from DCR. At the close of each quarter, districts submit a copy of their local databases to DCR for statewide compilation.

Hydrologic Unit Planning

DCR implemented a statewide Hydrologic Unit Planning (HUP) system, which divides the state into sub-watersheds of USGS cataloging units and identifies nonpoint source pollution water quality problems within these sub-watersheds. County hydrologic unit maps have been used to collect information on land use, livestock and poultry inventories, erosion rates, disturbed land, and sludge and fertilizer use within each watershed.

By prioritizing NPS pollution problems within the state, cooperating state agencies can optimize the use of funds made available for correcting nonpoint source pollution problems. The Virginia Agricultural Cost-Share Program continues to target funding based on these priorities.

Virginia Geographic Information System

VirGIS was developed by DCR and the Virginia Polytechnic Institute and State University (Virginia Tech) Department of Agricultural Engineering with contractual support from the Virginia Tech Information System Support Lab. VirGIS is a database used to track sources of NPS pollution and target limited management resources; however, VirGIS maps and data are made widely available for other uses.

OBJECTIVES (SHORT-TERM GOALS)

In order to achieve the overall goal as stated in the beginning of this chapter, seven objectives for the state's NPS pollution monitoring and tracking programs have been identified. These objectives, which are listed below, form the basis of a workplan for the implementation of a nonpoint source monitoring and tracking program.

In the context of these programs, **monitoring** refers to the physical, chemical and biological analyses of the various matrices; evaluation refers to the predictive measures of assessing potential NPS water quality impacts due to land use practices; and assessment refers to an evaluation of water quality based on monitoring data and land use practices. (For additional strategies, objectives, and tasks regarding implementation of monitoring and tracking management measures in the coastal zone refer to Chapter XIII Coastal Nonpoint Source Pollution Control Program.)

Objective 1. By 2001, evaluate the state's waters for NPS pollution related problems

The primary means to implement this objective will be the water quality programs implemented by DEQ, supplemented by water quality programs operated by other state and federal agencies and those operated by voluntary citizen groups. Please note that biological assessments may contain elements of habitat assessment.

Objective 2. Evaluate the state's waters, on a watershed basis, for NPS pollution related problems for targeting NPS pollution prevention activities

This objective will be coordinated by DCR with the support of the other organizations noted in the tables utilizing their specialized areas of expertise and scholarship.

Objective 3. Coordinate with other public/private groups that contribute to the state's understanding of NPS pollution related issues

DCR will lead, but will coordinate extensively with DEQ to achieve this objective.

Objective 4. Prioritize watersheds based on the potential of adverse impacts due to NPS pollution

This objective is primarily directed by DCR. Additional strategy items may be added to this objective at any time at the discretion of DCR.

Objective 5. Determine the effectiveness of NPS pollution control projects, programs, or strategies across various geographical scales (river basin to watershed to site-specific)

DCR will serve as coordinating agency for this objective with the cooperation of DEQ, USGS and the other organizations within NPSAC.

Objective 6. Investigate and determine NPS pollution related contributions or potential contributions to groundwater statewide

Coordination for this objective will be handled by DCR under the direction of NPSAC.

Objective 7. Improve support and use of citizen monitoring resources

DCR and DEQ will jointly oversee this objective utilizing their respective departmental citizen monitoring coordinators.

The respective strategy items will be conducted by the specified agency (DCR or DEQ) with oversight by NPSAC. The two agencies will provide progress reports on their activities for this objective to NPSAC on a regular basis.

TABLES OF OBJECTIVES & STRATEGIES

In the following tables, each objective is more fully outlined and specific agency related strategies and tasks are identified to implement the objective.

OBJECTIVE 1				
By 2001, evaluate the state's waters for NPS pollution related problems				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
1.1 Continue efforts, within resource limitations, to develop an ambient, biological and chemical water quality monitoring system capable of portraying NPS pollution related characteristics for all watersheds, through proper distribution and monitoring frequency		•DEQ •DCR	Ongoing	
1.2 Provide ambient/chemical and biological water quality sampling, within resource limitations, for all watersheds defined by DCR as high priority for potential NPS water quality problems	Sampling frequency to be consistent with requirements for reporting compliance with water quality standards set forth in Section 305(b)	•DEQ •DCR	Ongoing - Approx. every two years	
	Coordinate the location of these stations, both chemical and biological, to ensure representative coverage			

1.3 Assess the chemical and biological water quality monitoring data collected	Provide information regarding waters not meeting applicable water quality standards to DCR	•DEQ •DCR	Ongoing	
	Use both chemical and biological data to more accurately assess water quality for the state's 303(d) list			

OBJECTIVE 1 (Cont.)				
By 2001, Evaluate the state's waters for NPS pollution related problems				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
1.4 Determine potential sources of identified water quality impairments		•DEQ	Ongoing	
1.5 Evaluate additional monitoring technologies and objectives for addressing and identifying nonpoint sources of water pollution	To include limited use of probabilistic sampling design to determine statistically the extent of several key water quality indicators as a comparison to the results from DEQ's fixed station network	•DEQ •DCR	Begins 1999 - 2000	
1.6 Identify areas where enhanced monitoring is needed to better characterize actual or potential NPS pollution problems	Include priority NPS watersheds, karst areas and those areas that may be required to adopt agriculture pesticide management plans	•DCR •DEQ •Other state/ local agencies •Public/ private groups •VDACS	Ongoing	•General Fund
	Support fecal coliform typing research related to identification of fecal contamination sources			

1.7 Support research and demonstrations to better characterize the sources of fecal coliform water quality problems statewide	Efforts will be made to better communicate, coordinate and share information as it is developed and verified	•DCR •DEQ	1999-2004	•Grant funds
	Support fecal coliform typing research related to identification of fecal contamination sources			

OBJECTIVE 2				
Evaluate the state's waters, on a watershed basis, for NPS pollution related problems for targeting NPS pollution prevention activities				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
2.1 Identify pollutant loading estimates to assess the watersheds of the state using NPS pollutant loadings by source category	Gather existing land use, animal population, soil characteristics, census data and land disturbance data on a watershed basis statewide	•DCR	1999	•General Fund
	Frequency to be consistent with the development and submittal of the 305(b) and 303(d) reports submitted to EPA			
2.2 Integrate NPS pollution monitoring into the NPS watershed assessment through coordination of DEQ's monitoring and tracking program data with DCR's pollution potential rankings for NPS	Determine the association between monitoring station locations and watersheds being monitored	•DCR •DEQ	1999 and thereafter prior to 305 (b) schedule	•General Fund

2.3 Determine the miles of NPS impaired waters by watershed and use a derivation of the comparison of these results in the NPS pollution assessment process		•DCR	1999 and thereafter prior to 305 (b) schedule	•General Fund
2.4 Assess the state's 14-digit watersheds for NPS pollution characteristics in a manner similar to the federally approved process developed in the 1998 Unified Watershed Assessment and Restoration Priorities report of September 1998		•DCR	1999 and thereafter prior to 305(b) schedule	•General Fund

OBJECTIVE 2 (Cont.)				
Evaluate the state's waters, on a watershed basis, for NPS pollution related problems for targeting NPS pollution prevention activities				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
2.5 Report on the assessment of watersheds by NPS pollution problems	DCR will publish as a component of 305(b) report DCR will report assessment details in a separate NPS assessment report	•DCR •DEQ	2000 & every two years thereafter	•General Fund
2.6 Assist in the development or revision of the land use and land disturbance databases and in the development or revision of pollutant loading estimates where appropriate		•State, federal and local political sub-divisions (to include SWCDs) & univer-sities	2001	•General Fund

2.7 Refine the pollutant loading assessment methodologies such that total loads of NPS pollutants (primarily nitrogen and sediment) can be quantified on a watershed basis statewide	Review existing loading estimation techniques	•DCR •DEQ	2001	•General Fund
	Evaluate nutrient and sediment transport processes			
	Develop a confined animal database			
	Investigate the use of imagery for more accurately determining the land cover by watershed			

OBJECTIVE 2 (Cont.)

Evaluate the state's waters, on a watershed basis, for NPS pollution related problems for targeting NPS pollution prevention activities

STRATEGIES	RELATED TASKS	AGENCIES & OTHERS	TARGET YEAR	FUNDING SOURCES
2.8 Refine the process of assigning credits to installed agricultural BMPs and nutrient management plans, so that the NPS pollutant load reductions realized from these practices can be subtracted from the measures of potential loadings from the data collected in the first strategy item under this objective		•DCR	2001	•General Fund

2.9 Continue to refine tracking system for disturbed acres as reported under the Virginia Erosion & Sediment Control Program	Gather additional sources of land disturbance data and incorporate this information into the assessment process	•DCR •VDOT	1999-2001	•General Fund
2.10 Assess the pollutant loads associated with silvicultural operations and assess the effectiveness of BMPs		•DOF	1999-2001	
2.11 Assist in basin level assessment of NPS pollutant loadings through ongoing NAWQA and other studies	DEQ will provide flow data as resources allow to calculate loadings	•USGS •DEQ	Ongoing	

OBJECTIVE 2 (Cont.)				
Evaluate the state's waters, on a watershed basis, for NPS pollution related problems for targeting NPS pollution prevention activities				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
2.12 Continue to provide information on permitted dischargers, including sewage treatment plants (STPs) that could aid in the assessment of NPS pollutant loadings in impaired streams		•DEQ	Ongoing	

2.13 Add an impact due to failing septic systems into the watershed assessment process	Form an interagency committee to explore the potential problem of deteriorated or leaking septic systems, especially in the context of their impact on impaired streams and other water bodies	•DEQ •VDH •DCR	2003	•Unknown
2.14 Support research and demonstration projects to develop, verify and refine NPS pollution loading estimates for various nonpoint sources	Evaluate models developed and used to account for septic loadings in other states Evaluate and adjust monitoring parameters to more accurately define potential NPS problems	•DCR •State and federal agencies	Ongoing	•General Fund •Grant Funds where appro-priate
2.15 Conduct and support research and demonstrations related to assessing pollutant loadings generated by silvicultural activities		•DOF		

OBJECTIVE 3				
Coordinate with other public/private groups that contribute to the state's understanding of NPS pollution related issues				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
3.1 Conduct a survey of known public/private groups that conduct and/or support NPS monitoring activities within the state	Where a relationship would be beneficial to both parties, explore the possibility of formalizing the relationship with a memorandum of understanding	•DEQ •DCR	2000	

3.2 Survey and identify existing academic research (and researchers) of potential importance to NPS pollution monitoring programs	Integrate these efforts into state programs Continue and expand efforts that assist NPS pollution monitoring	•DEQ	2000	
3.3 Contact universities and colleges located within the state that conduct research or education activities that increase the understanding of NPS pollution and control measures	Convene a meeting with the appropriate institutions to discuss the state's research needs regarding NPS pollution	•DCR •State agencies	2000	•General Fund

OBJECTIVE 4				
Prioritize watersheds based on the potential of adverse impacts due to NPS pollution				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
4.1 Incorporate individual ranking components and a measure of the level of heritage resources within each watershed that are threatened by NPS impairments		•DCR	1999 & following every water-shed assess-ment thereafter	•General Fund

4.2 Add a measure of the threat to human health caused by NPS water quality impairments as a means of prioritizing watersheds		•DCR •VDH	2001	•Unknown
4.3 Complete a scenic rivers designation component to prioritizing watersheds within their assessed rankings		•DCR	2000	•General Fund

OBJECTIVE 5				
Determine the effectiveness of NPS pollution control projects, programs or strategies across various geographical scales from river basin to watershed to site-specific				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
5.1 Ensure that each watershed implementation project funded with federal or state dollars includes components that will document the environmental benefits	Wherever feasible, based on geographical and/or temporal scale, these benefits will be measured in terms of physical, chemical and/or biological improvements	•DCR	Ongoing	•Grant Funds

5.2 Provide for monitoring and other technical assistance to measure the success of watershed implementation projects		•DEQ •State and federal agencies •Citizen monitor-ing groups	Ongoing	
5.3 Support monitoring and other research studies to assess the effectiveness of individual BMPs and other control strategies particularly for new and innovative technology where effectiveness data is not available	Where applicable, the state will utilize information collected by other jurisdictions and organizations to supplement its evaluation of BMPs and other control strategies	•DCR •State and federal agencies	Ongoing	•Grant Funds •General Fund
5.4 TARGET YEAR Section 319 funding for monitoring the effectiveness of new and innovative BMP strategies		•DCR •NPSAC	2000	•Grant Funds
5.5 Continue implementation of the Chesapeake Bay Tributary Monitoring Program to measure the long-term effectiveness of point and NPS pollution programs within the Chesapeake Bay basin		•DEQ	Ongoing	•Bay Grant

OBJECTIVE 5 (Cont.)				
Determine the effectiveness of NPS pollution control projects, programs or strategies across various geographical scales from river basin to watershed to site-specific				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**
5.6 Support other basin wide monitoring efforts to better characterize NPS loadings and the success of implementation programs in high priority NPS pollution basins		•DEQ •DCR	2000	

5.7 Continue the Polecat Creek watershed study to determine the efficacy of existing land use regulations and policies in protecting adjacent water quality during urban development activities	Monitor the quality and quantity of surface and ground waters, biological status of the streams and changes in land use/land cover Continue water quality data analysis and model development to investigate the impacts of land use changes on water quality If trend monitoring stations detect apparent relationships between development activities on adjacent land and pollution loadings in surface and ground waters, CBLAD will seek funding to conduct special short-term projects to attempt to confirm and quantify such relationships	•CBLAD •DCR	1993-2003	•Bay Grant
5.8 Support research and demonstrations to assess water quality problems related to plasticulture agricultural production, particularly on the Eastern Shore	Develop a plasticulture BMP handbook to provide appropriate technical information	•DCR •NRCS •SWCDs •VDACS	2000-2001	•Grant Funds
5.9 Continue the implementation of basin-wide NAWQA studies on the Potomac River basin, Albemarle-Pamlico Drainage basin, Upper Tennessee River basin and the Kanawha/New River basin	Integrate the results of these studies into ongoing NPS assessment and implementation programs	•USGS •State and federal agencies	Ongoing	

OBJECTIVE 5 (Cont.)				
Determine the effectiveness of NPS pollution control projects, programs or strategies across various geographical scales from river basin to watershed to site-specific				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**

5.10 Continue to use the statistical model ESTIMATOR to calculate loads of nutrients and suspended solids from the nine major tributaries of the Chesapeake Bay near the fall line and at selected other water quality monitoring stations in the Chesapeake Bay Basin	Evaluate model results to gain insight into the relationship between water quality, streamflow and season Continue to supply data on nutrient and sediment loads estimated at the fall line stations to the Chesapeake Bay Program Assess trends at the fall line to measure upstream progress toward nutrient reduction goals	•USGS •Chesapeake Bay Program	Ongoing	
5.11 Continue to support efforts of the Tennessee Valley Authority (TVA) to monitor and assess NPS problems and control objectives in the upper Tennessee basin		•NPSAC •TVA	Ongoing	•General Fund
5.12 Incorporate methods to assess the effectiveness and implementation of the Chesapeake Bay Tributary Strategies		•DCR •DEQ	Ongoing	•Bay Grant

OBJECTIVE 6				
Investigate and determine NPS pollution related contributions or potential contributions on groundwater statewide				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**

6.1 Support research and demonstration projects to assess NPS pollution effects on groundwater resources statewide		•DCR	Ongoing	•319 Grant •Other available funding
6.2 Implement pesticide-specific ground water management plans, if final federal regulations are promulgated and sufficient funding is received		•VDACS •NPSAC	Pending	•Grant Funds
6.3 Make groundwater monitoring a component of watershed implementation projects, particularly in areas known to be susceptible to groundwater pollution		•DCR	2000-2001	
6.4 Continue to support education, research and demonstration projects related to ground water protection in karst regions of the state		•DCR	Ongoing	•General Fund •Grant Funds
6.5 Continue to research, demonstrations and educational activities to better characterize the interconnectedness of ground and surface waters and related pollutant transfer mechanisms		•DCR •State and federal agencies	Ongoing	•General Fund •Grant Funds
6.6 Continue the groundwater component of Polecat Creek Project	Monitor the quality and quantity of ground water resources under different land use and hydrogeologic conditions	•CBLAD •USGS	Ongoing	•Bay Grant
6.7 Promote the development and utilization of the FARM*A*SYST and HOME*A*SYST programs		•VCE •NPSAC	Ongoing	
6.8 Interpret the findings of the ground water component of the NAWQA studies in Virginia and help integrate the findings into ongoing NPS pollution assessment and implementation programs		•USGS •State and federal agencies	Pending	

OBJECTIVE 7				
Improve support and use of citizen monitoring resources				
STRATEGIES	**RELATED TASKS**	**AGENCIES & OTHERS**	**TARGET YEAR**	**FUNDING SOURCES**

7.1 Establish a formal procedure to provide technical expertise and training to citizen monitoring groups to enhance their effectiveness and capabilities to provide water quality information which can be directly integrated into NPS pollution assessment and implementation activities	Upon request, agencies will provide available information specific to a particular watershed to give monitoring groups guidance on how to prioritize methods in a study design that provides maximum benefit to the commonwealth	•DEQ •DCR •Citizen monitor-ing groups	January, 2000	
7.2 Develop acceptable quality assurance/quality control program and project plans to ensure the validity of data collected by citizen monitoring groups	Establish a review process for the approval of quality assurance/quality control program and project plans.	•DEQ •DCR •Citizen monitor-ing groups	January, 2000	
7.3 Continue to integrate citizen monitoring information into the 305 (b) report		•DEQ	Ongoing	
7.4 Citizen data collected under state or federally approved quality assurance plans will be used to identify potential water quality impairments	This data will provide direction for future monitoring to potential NPS problem areas	•DEQ •Citizen monitor-ing groups	Starting with April 1, 2000 report	
7.5 Support the use of citizen monitoring to assess the effectiveness of water quality implementation projects		•DCR	Ongoing	
7.6 Continue to provide monitoring coordinators who can provide oversight, education and assistance to citizen monitoring groups	Memorandum and letters of agreement will be developed and signed by state agencies and citizen monitoring groups	•DEQ •DCR •Citizen monitor-ing groups	Ongoing	

OBJECTIVE 7 (Cont.)
Improve support and use of citizen monitoring resources

STRATEGIES	RELATED TASKS	AGENCIES & OTHERS	TARGET YEAR	FUNDING SOURCES
7.7 Continue to support educational outreach opportunities to exercise awareness by citizens of all ages to the sources and effects of nonpoint and point source pollution and our state's water quality assessments, including TMDL and other state programs		•DEQ •DCR •Citizen monitor-ing groups	Ongoing	
7.8 Review any agreement that the agencies have entered into with citizen monitoring groups		•DEQ •DCR	Annually, beginning summer 1999	
7.9 Enhance procedures for submittal of citizen monitoring data to agencies		•DEQ •DCR •Citizen monitor-ing groups	2000	•Section 319 Grant

STATE STATUTES AND REGULATIONS

Various laws and regulations apply to the state's monitoring, tracking, and related supporting activities. The specific state citations are provided below:

Ground Water Management Act of 1992 (*Code of Virginia* §62.1-254 et. seq.)

Toxics Reduction in State Waters of 1997 (*Code of Virginia* §62.1-44.17:2 et. seq.)

State Water Control Law (*Code of Virginia* §62-42)

Water Quality Improvement Act of 1997, as subsequently amended (*Code of Virginia* §10.1-2117 et. seq.)

Water Quality Monitoring, Information and Restoration Act of 1997, as subsequently amended (*Code of Virginia* §62.1-44.19:4 et. seq.)

FEDERAL LAWS AND REGULATIONS

Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977, and as subsequently amended (33 U.S.C. 1251 et. seq.)

Safe Drinking Water Act of 1974, as subsequently amended (42 U.S.C. 300f et. seq.)

Chesapeake Bay Agreement of 1987, as amended in 1992 and including all directives signed by the programs's Executive Council.

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